

PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION  
International Bureau



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : D04H 11/00, D06Q 1/06, D06P 1/00, D06B 21/00	A1	(11) International Publication Number: <b>WO 97/37072</b> (43) International Publication Date: 9 October 1997 (09.10.97)
(21) International Application Number: PCT/US97/05460 (22) International Filing Date: 2 April 1997 (02.04.97) (30) Priority Data: 08/626,396 2 April 1996 (02.04.96) US (71) Applicant: MICROFIBRES, INC. [US/US]; 1 Moshassuck Street, Pawtucket, RI 02862 (US). (72) Inventors: VAN ALBOOM, Carlos; Dendeldonk 7, B-9230 Wetteren (BE). MCCULLOCH, James, R.; 38 Cooke Street, Providence, RI 02906 (US). (74) Agent: WOLF, David; Wolf, Greenfield & Sacks, P.C., 600 Atlantic Avenue, Boston, MA 02210 (US).	(81) Designated States: BY, CA, IL, MX, PL, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).  Published With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.	

(54) Title: IMPROVED PRINTED FLOCKED PILE FABRIC AND METHOD FOR MAKING SAME



(57) Abstract

A printed multicolor synthetic pile fabric having a substrate and pile formed of fibers of substantially uniform length and diameter with the fibers arranged in random groups extending uniformly across the entire width and along the entire length of the fabric. Each group comprises a random number of fibers extending at an angle and in a direction that randomly varies from the angles and directions of the fibers in adjacent groups. The fibers within each group are preferably set in the greige goods.

**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KE	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakstan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

## IMPROVED PRINTED FLOCKED PILE FABRIC AND METHOD FOR MAKING SAME

5

### Field of Invention

The present invention relates to an improved printed flocked pile fabric and method for making the same.

### Background of Invention

10 Conventionally made printed flock fabrics involve a process in which the fabric, comprising a flocked coated substrate, is printed utilizing screen printing techniques. Thereafter, the pile is steamed, washed, and properly finished. These products generally result in a fabric having a pile surface of uniform texture, in which the individual fibers are uniformly oriented. Such fabrics have no textured surfaces and rely primarily on the pattern that is imprinted to  
15 provide the fabric with its desired characteristics.

Additionally, pile fabrics have been made with textured surfaces. Insofar as the Applicant is aware, however, the textured surfaces herein described have not been fabricated in a multicolor flocked pile fabric in which greige goods are formed with the pile fibers arranged in random groups, extending uniformly across the width and along the length of the fabric, as a  
20 result of a specific sequence of steps, including the washing of the greige goods prior to printing.

In the prior art of fabricating multicolored printed flocked pile fabric with a uniform non-textured surface, occasional rejects occur when small numbers of the fibers forming the pile are misoriented from the desired lay of the pile. These rejects or seconds usually result in an imperfect fabric having occasional creases or misdirected groups of fibers that mar and distort  
25 the uniform surface of the fabric. The source of the occasional random orientation of the fibers in these seconds arises from a variety of processing problems. Heretofore, these random arrays of discrete misoriented fibers have been uniformly considered unacceptable. It has therefore been conventional to attempt to eliminate this non-uniform appearance of printed flocked fibers.

In addition to occasional random appearances of discrete misoriented fibers in  
30 multicolored flocked fabrics, uniformly dyed pile fabrics have also been made of natural woven fibers, such as cotton or viscose. In such woven systems, cotton or viscose pile fabrics are conventionally dyed. After dyeing, fabrics can be printed using conventional print techniques such as pigment printing or discharge printing.

Flocked fabrics have also been piece dyed. In these products, the fabric is dyed with a  
35 single color by conventional dyeing techniques. It is during the dyeing process that the fabric is

formed with its randomly arranged fibers. Because the fibers are dyed at temperatures in the order of 90° C or 190° F that are necessary to set the dyes, the resultant product does not lend itself to subsequent color treatment. In particular, the fabric has a solid ground which cannot be further processed with resist printing. If dyed flocked fabrics were subsequently printed with pigment or direct prints, the range of multicolor possibilities would be severely limited by this process.

Texturing has also been attempted by air embossing flocked fabrics and, thereafter, printing. Additionally, heat embossing greige goods and thereafter imprinting them have also been attempted. These systems, however, have certain limitations with respect to the appearance, softness of pile, and styling.

Individual steps that are useful in practicing the present invention have also been well known in the fabric trade. This includes, for example, such practices as open width washing, in which greige goods are washed in an open width or, alternately, in a Beck machine prior to printing. The purpose of such washing steps, however, is to prepare the pile fabric by assuring the directional lay of the pile or, alternately, for providing a light scouring for purposes of improving color adherence or for creating a uniform surface of the pile in one direction. Printed flocked fabrics have been washed in commercial jet or bleach machines after printing. However, it is not economically feasible to obtain a random textured effect in this manner.

Heretofore, the processes that have been commercially available have not been useful in creating a printed pile fabric in which the surface texture of the pile is random or textured.

### **Summary of Invention**

The present invention provides a method of fabricating a multicolor printed flocked pile fabric having a non-uniform or textured pile surface, in which the fibers forming the piles are oriented in small groups in various directions across the entire width and along the entire length of the fabric to provide a distorted or casual surface appearance, unlike the conventional velvet-like surface appearance of ordinary pile fabrics.

In the present invention, there is provided an improved method for fabricating a printed pile flocked fabric having fibers arranged in small groups, randomly oriented, over the entire length and width of the fabric, with these fibers providing a textured surface of random or distorted appearance.

A further object of the present invention is to provide an improved and different printed pile fabric having more volume, a softer hand, and a gentler crush effect than fabrics heretofore made using conventional techniques.

A further object of the present invention is to provide an improved method of making  
5 printed flock fabrics having textured surfaces.

#### **Brief Description of the Drawings**

The foregoing objects and advantages of the present invention will be more clearly understood when considered in conjunction with the accompanying drawings, in which:

Fig. 1 is a top plan view of a segment of fabric made in accordance with the present  
10 invention;

Fig. 2 is a schematic cross section of a fabric made in accordance with this invention;

Fig. 3 is a schematic fragmentary plan view of a segment of fabric made in accordance with the present invention, without the print illustrated; and

Fig. 4 is a schematic plan view similar to Fig. 3, illustrating a defective fabric segment.  
15

#### **Description of Preferred Embodiment**

In a conventionally formed multicolor flocked printed pile fabric, the surface of the pile is uniform and smooth and has no effective textured appearance, because the individual fibers forming the pile are secured to the substrate at substantially parallel angles to one another. In the  
20 fabric made in accordance with the present invention, the fabric 10 is formed with a substrate 11 and flocking comprising fibers 14 secured to the substrate conventionally by a layer of adhesive 16. The fiber size, shape, and weight may vary depending upon the specific application desired. The fibers may be dyed or not dyed. Typically, in the present invention, however, the individual fibers are formed in groups 18, 20, 22, etc. of random size and shape over the entire width and  
25 length of the fabric, with the individual fibers within each group oriented in directions angular to one another. Thus, for example, one group may be at an angle of 70° from the substrate and extend in one direction, while an adjacent group may have the fibers at an angle of 85° from the substrate and extend in a direction normal to this direction of the fibers of the first group. These groups 18, 20, 22, etc. have tuft-like appearances that extend across the entire surface of the  
30 fabric 10, forming a surface of non-uniform appearance, as best illustrated at 10. This non-uniform appearance exists irrespective of the print or color design selected for the fabric. In this case, the multicolor print design includes, for example, a series of line designs 30.

In viewing the embodiment of Figure 1, the textured nature of the fabric may be noted from the spacing visibly noticeable between groups that results from the random variation in angles and directions of the fibers within the groups. These spaces 42 have essentially hairline appearances, for example, as illustrated at 40 and 41 in Fig. 2. Because the angles of the fibers to the substrate vary, the upper surface of the fabric is non-uniform, as illustrated by comparing the relative heights of groups 18 and 20.

The nature of the invention may also be understood from consideration of Figures 3 and 4. Here there is illustrated schematically a corner piece of fabric with the groups 18, 20, and 22. As illustrated, each group has a random shape and size that is defined by the different orientations of fibers from group to group. The defining borders of a group have a visual appearance of a fine line into the naked eye, as illustrated at 25. This fine line is formed by spacing 42 in the embodiment illustrated, comprised of very short, erratically directed segments. However, if the fabric is processed in a manner outside the heating cycles described, the fibers may occasionally orient along very long lines. Such lines have the appearance of unwanted creases 50 and should, in the embodiment described, be avoided. However, there may be occasions in which a fabric is formed intentionally with lines similar to line 50. If so, however, such lines should appear sufficiently frequently across the width and along the length of the fabric to create an appearance that the crease is a desired component of the pattern, much like the long lines that frequently appear in leather.

The spaces between groups illustrated in Fig. 1 have a hairline appearance and, in the embodiment of the invention illustrated, the groups have relatively small shapes defined by sides that are of in the order of  $1/16$ " to  $1/2$ " in length. These lines, defining one group from the other, may be varied in length and, to some extent, in width, by varying the parameters of the process hereafter described. The hairlines illustrated at 40 and 41 may, for example, be much longer in length than those heretofore described, by suitable variations in the parameters of the application and may, in fact, take on the appearance of creases, with the creases extending into the adhesive layer 16 or substrate 11. However, in forming a fabric of this type with longer lines, it is important that the fabric have a substantially uniform appearance over its entire length and width. In short, an occasional line clearly defined, for example, two or three inches long or more, appearing at a foot or two or three apart in the fabric, otherwise formed with creases or lines illustrated in Fig. 1, would not be desirable. The fabric should have uniformity throughout its



surface to achieve the desired textured effect. These aberrant lines may be avoided by proper control of the parameters of the process.

The fabric illustrated in Figs. 1 and 2 is formed by first subjecting the flocked substrate or greige goods to a batch washing cycle, prior to printing, in which the wash cycle is designed to  
5 create a non-uniform, random laydown of the fibers over the entire fabric being treated, which achieves the desired textured or distorted appearance. As used herein, greige goods include fabric having either dyed or undyed flocked fibers. In this process, selected flocked greige goods are prepared for washing. These flocked greige goods may vary, depending upon the particular end product desired, but typically, and for example, may comprise a poly-cotton woven  
10 Osnaburg, an acrylic adhesive layer and a flocked pile of polyamide fibers. The substrate, typically, may have a 3.4-ounce-per-square-yard weight, while the fibers, having cut lengths of .045" to .050", with a denier of 1.7 and a weight of 2 oz per square yard, are secured to the substrate by a suitable acrylic adhesive which may, for example, weigh 2.3 oz. per square yard. Other possible substrate fiber combinations may be selected, depending upon the particular  
15 purposes desired.

The greige goods are preferably cut into uniform lengths for batch processing. Thus, for example, eight lengths of greige goods are each formed into tubes by tacking or basting stitches along the length of the fabric to form elongated tubes. For the particular example set forth, the fabric tube would preferably be in the order of 200 meters in length. The tubes are tacked,  
20 preferably with the pile on the inside, although, in alternate processes, arranging the piles on the outside or even processing the fabric in non-tubular form is contemplated. However, the tubular forms are preferred.

After the greige good fabrics are formed into the tubes, they are loaded into a jet-dyeing machine for further processing. The machine should be fully loaded. Alternately, a Beck dyeing  
25 machine may be used, or even a continuous washing range. Liquor is added to the machine, with a liquor/fabric ratio of 1:10, although a range of 1:5 to 1:15 is possible. The liquor is formed by the sequential addition of water at 30° C. Thereafter, a fabric softener may be added. The fabric softener may be a commercially available one, sold under the mark CIBA FLUID-U. Preferably, 1 cc per liter of water is added. After the liquor and fabric have been loaded into the machine, a  
30 non-ionic washing agent may be added, depending upon the particular fiber that comprises the fabric. The purpose of the non-ionic washing agent is to remove spin oils; preferably approximately 1 cc per liter of water is added. After the fabric and liquor are in the machine, the

temperature of the liquor is raised to 40° C. It is preferable to maintain the temperature at at least 40° C in order to minimize the creasing that might otherwise occur in the washing cycle. The fabric is washed for 30 minutes, while the temperature is maintained at preferably at least 40° C. After this washing or scouring, the liquor is removed, and the dyeing machine is refilled. The liquor is warmed to 80° C. Preferably, a desizing agent is added. Ordinarily no more than 2 grams are needed. The purpose of the desizing agent is to take off the starch from the substrate, which further assists in minimizing the likelihood of creases forming and softens the overall fabric. The fabric is then again washed, with the temperature maintained at 80° C. Following this second wash, the dyeing machine is emptied of the liquor and refilled once again with water at 30° C. After the water is introduced at 30° C, it is raised to 70° C and the fabric again rinsed for 15 minutes at 70° C. The water is then removed and the dyeing machine once again refilled with water at a temperature of in the order of 30° C and rinsed for a further 10 minutes. The water is again removed and the fabric placed in a suitable centrifugal extraction machine, where the water is extracted for in the order of 15 minutes. During the extracting cycle, the fabric will ordinarily remain in its tacked, tubular condition. Drying continues until about 75% of the water has been removed.

Following the removal of the water on the centrifugal extraction machine, the fabric is then opened by removing the basting stitches, and the fabric is flat folded.

The fabric is thereafter dried on a Tenter frame under an air flow which is slow enough so that the pile is not disturbed. Typically, the drying may take place with an airflow ventilator fan rotating at 3,000 RPM over the fabric in which the Tenter frame is moving at a rate of in the order of 20 meters per minute and at a temperature of in the order of 160° C for a period of in the order of one minute. The fabric is thereafter wound up on an A frame in a manner so as to avoid unnecessary crushing or compression of the pile fibers. The wind-up tension of the A frame should also be selected to permit the pile to remain erect and present a consistent surface texture of the winding from one end to the other. Alternately, the fabric may be flat folded.

The temperature parameters selected for washing and treating the fabric prior to conventional screen printing set forth in the above exemplifications are intended to suggest a temperature in which re-orientation of the pile fibers in the random array described is effected. Typical temperatures which may be used range from between 20° C and 90° C, as well as a dwell time of 1-4 hours. The particular size, the arrangement of the various groups, and the defined lines may be varied from very fine to very long or narrow to wider, depending upon the



particular parameters selected. It should be recognized that when pile fabric is subject to a wet printing process, pile, as for example nylon flocked pile, is heat set during the steaming process when subjected to temperatures in excess of about 200° F. For that reason, it must be recognized that once the fabric has been steamed at temperatures in excess of this order of magnitude, the  
5 random textured effect cannot be effectively removed unless the fabric is subjected to higher temperatures.

After the fabric has been dried on a Tenter frame, it is then subject to a conventional printing process, in which the fabric is, preferably, printed by screen printing processes, using a series of screens for different colors. Resist, direct, or pigment dyes may be used. Thereafter,  
10 the printed fabric is steamed, washed once again, and finished in a conventional fashion. As an alternative to the wet printing process, transfer paper printing may also be used.

As noted previously, the characteristics of the finished product may be changed by varying the cut length or size of the fibers, their shape, or the flock weight. Increasing the fiber length, for example, tends to increase the appearance of a random effect. Similarly, increased  
15 flock weight appears to increase the appearance of a random effect.

Having thus described one particular embodiment of the invention, various alterations, modifications, and improvements will readily occur to those skilled in the art. Such alterations, modifications, and improvements are intended to be part of the disclosure and are intended to be within the spirit and scope of the invention. Accordingly, the foregoing description is by way of  
20 example only and is not intended as limiting. The invention is limited only as defined in the following claims and the equivalents thereof.

Claims

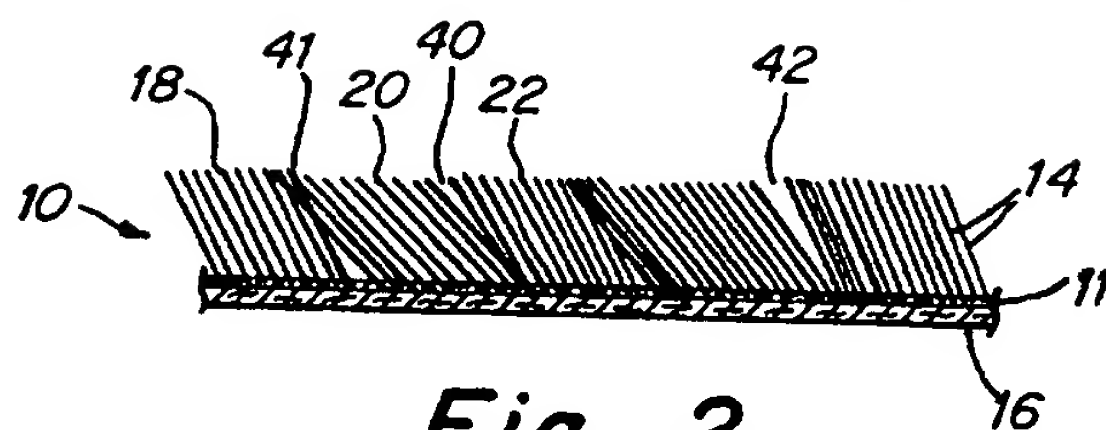
1. A printed multicolor synthetic pile fabric having a substrate and a pile formed of fibers of substantially uniform length and diameter, with the fibers arranged in random groups extending uniformly across the entire width and along the entire length of the fabric, with each  
5 group comprising a random number of fibers extending at an angle and in a direction that randomly varies from the angles and directions of the fibers in adjacent groups.
2. A printed pile fabric as set forth in claim 1, in which the fabric is a flocked fabric formed by washing the flocked fabric prior to printing, whereby the fibers are reset from an array in which the fibers extend in the same direction at essentially the same angle to an array defined  
10 by said random groups.
3. A printed pile fabric as set forth in claim 1, wherein the random variation in angles and directions of the fibers within each group define visible spaces on the surface of said groups.
4. A method of forming a printed multicolored flocked pile fabric having a substrate  
15 and flocking formed of fibers of substantially uniform length, wherein the fibers are arranged in random groups extending uniformly across the entire width and along the length of the fabric, with each group comprising a random number of fibers extending at an angle and in a direction that randomly varies from the angles and the directions of adjacent fibers, comprising the steps of washing greige goods at a temperature and time period sufficient to randomly re-orient the  
20 fibers forming the flocked surface from uniform parallel orientation into random groups of fibers with angular and directional orientations that vary from one group to the other and thereafter drying and printing the substrate with the fibers in said re-oriented position.
5. A fabric as set forth in claim 1 wherein said fabric is multicolored printed with a plurality of screens.
- 25 6. A fabric as set forth in claim 1 wherein said fabric is multicolored transfer printed.
7. A fabric as set forth in claim 6 in which said fabric is heat set before printing.
8. A fabric as set forth in claim 2 wherein said flocked fabric is heat embossed prior to washing and printing.
9. A fabric as set forth in claim 2 wherein said flocked fabric is air embossed prior to  
30 washing and printing.
10. A fabric as set forth in claim 1 wherein the fabric is dyed before printing.

11. A fabric as set forth in claim 1 wherein said fibers are arranged in said random groups when said fabric is in a greige goods stage.

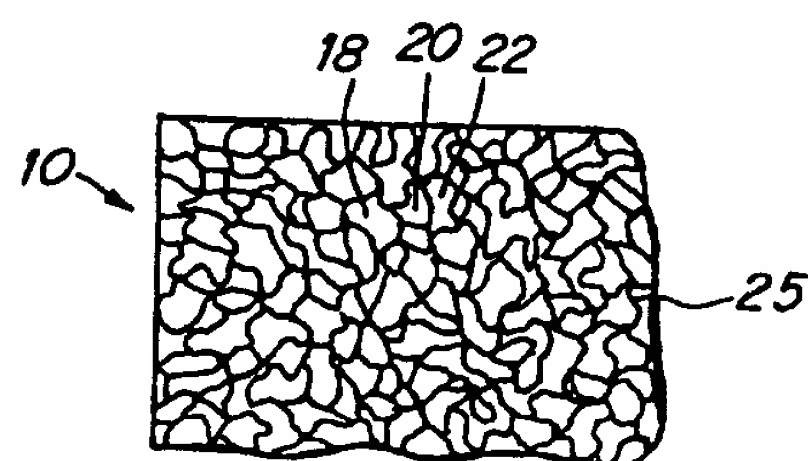
12. A fabric as set forth in claim 11 wherein the said fibers in said greige goods stage are dyed.



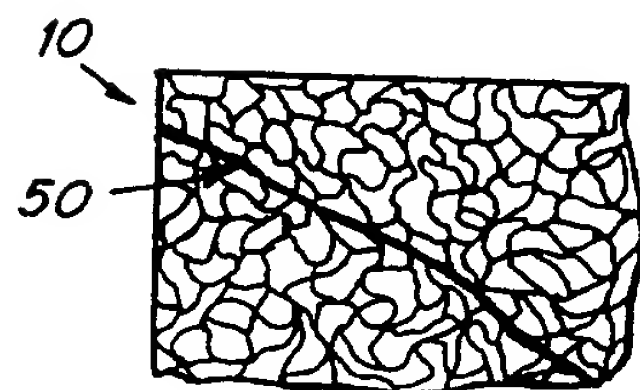
*Fig. 1*



*Fig. 2*



*Fig. 3*



*Fig. 4*

# INTERNATIONAL SEARCH REPORT

International Application No  
PCT/US 97/05460

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 6 D04H11/00 D06Q1/06 D06P1/00 D06B21/00

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
IPC 6 D04H D06Q D06P D06B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 259 853 A (FLEISSNER HANS) 7 April 1981 see column 1, line 31 - line 62 see column 3, line 14 - line 39 ---	1-5,11
P,X	WO 96 29462 A (MICROFIBRES INC) 26 September 1996 see page 3, line 8 - line 22; figure 1 ---	1-5
A	US 4 147 813 A (CASEY JAMES P) 3 April 1979 see column 5, line 8 - line 20; figures 2-7 ---	1-12
A	EP 0 581 614 A (MICROFIBRES INC) 2 February 1994 see the whole document --- -/-	1-12

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

### \* Special categories of cited documents :

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

- \*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- \*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- \*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- \*Z\* document member of the same patent family

Date of the actual completion of the international search

30 July 1997

Date of mailing of the international search report

11.08.97

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax (+31-70) 340-3016

Authorized officer

Barathe, R



# INTERNATIONAL SEARCH REPORT

Inter mal Application No  
PCT/US 97/05460

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>GB 1 431 958 A (UNITED MERCHANTS &amp; MFG) 14  April 1976  see the whole document  -----</p>	1-12

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 97/05460

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4259853 A	07-04-81	DE 2805010 A	09-08-79
		DE 2822977 A	29-11-79
		BE 873955 A	29-05-79
		GB 2015598 A,B	12-09-79
		JP 1305199 C	28-02-86
		JP 54112282 A	03-09-79
		JP 60030386 B	16-07-85
-----	-----	-----	-----
WO 9629462 A	26-09-96	NONE	
-----	-----	-----	-----
US 4147813 A	03-04-79	NONE	
-----	-----	-----	-----
EP 0581614 A	02-02-94	DE 581614 T	16-03-95
		ES 2060554 T	01-12-94
-----	-----	-----	-----
GB 1431958 A	14-04-76	AR 201120 A	14-02-75
		US 3916823 A	04-11-75
-----	-----	-----	-----